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ORGANIZING FOR QUALITY:  
A STRUCTURAL PERSPECTIVE

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# ORGANIZING FOR QUALITY: A STRUCTURAL PERSPECTIVE \*

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## ABSTRACT

If "Quality-the Universal Equation for Excellence," then the implementation of programs that will achieve quality ought to be a universal concern. If this holds true, then certain questions must be answered, and the answers will be situation specific, before a quality assurance program is designed and implemented. For instance: What is quality? Which standards apply? How are those standards translated into programs? How are the programs implemented? and perhaps a host of other questions. Quality may be a universal concern, but the answers to these specific questions are local; and the answers have often been wrong, as evinced by the many failures that have been reported.

This paper discusses an aspect of QA program implementation that often has been overlooked: existing organizational structures. The paper's premise is that existing organizational structures have a great deal to do with an organization's culture and therefore must be considered when implementing QA programs.

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The paper will review major quality assurance programs descriptions as are found in several standards and in the writings of Crosby, Feigenbaum, and Juran. The review will show that quality assurance programs are concerned with both quality achievement and demonstrability of that achievement.

Next, a review of organizational structures will be considered. Two traditional ones: hierarchical and matrix structures, and an emerging one, parallel structure. Characteristic traits of each and their importance will be discussed.

The paper will conclude with suggesting a method for implementing QA programs to existing structures. The method contemplated places the QA professional in the role of change agent. The method's basis is a critical review of what is needed in a QA program, and what already exists in the structure.

## INTRODUCTION

This paper's subject is organizational structure. It is a subject often overlooked when quality practitioners gather to discuss the implementation of quality assurance programs in organizations that formerly did not have such programs, or where the current programs are ineffective and have to be replaced. A discussion of organizational structure is a discussion of how all the parts of an organization are arranged, or ought to be arranged, in order to facilitate the pursuit of an organization's objective. The emphasis here is on all the parts, not just that part of the organization dealing with quality assurance.

An organization's structure is a function of many considerations. Structure by itself does not provide anyone the assurance that an organization is operating efficiently and effectively, nor can organizational inefficiency be blamed on just structure alone. Students of management have the option of specializing in one of over 80 fields and organizational structure is but one of these. It is basic, however, that when people form a coalition to accomplish an agreed upon goal, division of labor is inevitable and that therefore the effective coordination of work is a fundamental concern.<sup>1</sup> An appropriate structure enhances coordination and, conversely, an inappropriate structure mitigates against it.

An example will illustrate this. The Hewlett-Packard Company manufactures electronic testing and measuring equipment and minicomputers. Over several decades its structure evolved into one characterized by fiercely independent divisions that essentially acted as autonomous entities within the overall organization. More recently H-P's customers demanded coordinated solutions to their problems and H-P necessarily had to combine

its various products into integrated systems. H-P's organizational structure caused confusion. The integrated systems called for hybrid products that did not quite belong to any one of the existing divisions. "'Organizational boundaries kept us from optimizing our competitive advantage as a solution supplier', chief operating officer Dean Mortan said."<sup>2</sup> H-P restructured to provide an organization more conducive to the selling of integrated solutions.

This paper then will consider from a structural perspective what might be required to make quality happen. First, however, an important distinction must be made. There are two ways in which quality assurance programs can come to an organization. One may be called customer induced quality assurance programs. The best examples of this are procurement contracts let by agencies of the federal government. Many quality assurance programs have their origin in a federal contract clause that mandates their existence. Customer induced quality assurance programs characteristically are an adjunct to the organization and their principal function is not so much the attainment of quality, but rather the demonstrability of quality to an external agent. As any quality professional can attest to, and as the number of legal actions bear witness, the two are not necessarily the same.

The second way in which quality assurance programs can come to an organization is through management's own realization that an organization's very survival depends on installing an effective program to assure the quality of its products. Such an internally induced requirement comes from top management and usually has not only top management's support but its full participation as well. In internally induced quality assurance programs the emphasis is on end-product quality with little concern for demonstrability to external agents, because the market place is the final arbitrator.

## MAJOR ORGANIZATIONAL ASPECTS OF A QUALITY ASSURANCE PROGRAM

The decision to develop and implement a quality assurance program where there was not one before, or to change an existing one into something more effective, is a step that will have far reaching consequences for any organization. The effort will be non-routine, it should be done as quickly as possible, and it involves all of the organization. In short, it qualifies for what Juran and Gryna call the project management concept. It calls for a special coordinating plan, a project, with a project manager in charge for the development and possibly the subsequent implementation of the resulting program.<sup>3</sup>

More likely than not such a project will, at least initially, involve a search of the existing literature. The literature divides into two types: national consensus standards and publications, usually books, authored by nationally recognized experts. The standards themselves are of two kinds, multi-level and generic. Multi-level standards are written from the customer's point of view and are used in situations where the need for a quality assurance program is customer induced. A generic standard is usually employed when internally induced quality programs are under consideration. Generic standards are "...designed from the perspective of the manufacturer to satisfy perceived market place needs on a cost-effective basis."<sup>4</sup> For purposes of this paper a review of the literature would emphasize the organizational aspects of a quality assurance program.

Perhaps the most often used and widely applied quality standard is Military Specification MIL-Q-9858A, Quality Program Requirements. It is a very useful specification in that it is sufficiently broad to allow for a wide range of applications. With respect to organizational concerns,

MIL-Q-9858A requires that all tasks pertaining to quality must be prescribed. Furthermore, people who perform quality tasks must be placed sufficiently high in the organizational hierarchy to be able to effect solutions for quality problems.

The specification's companion handbook, H-50, explains that although strict compliance with MIL-Q-9858A is required, it "...does not specify an organizational arrangement of any kind for meeting these requirements."<sup>5</sup> This is probably the only example of a multi-level standard that does not specifically require an independent quality assurance function.

Another standard, one used throughout the nuclear industry, is ANSI-ASME NQA-1-1983, Quality Assurance Program Requirements for Nuclear Facilities. It consists of eighteen elements that collectively constitute a complete quality assurance program for the construction of nuclear power plants. Organization is addressed in the first element. It requires that the organizational structure be documented. It further stipulates that persons responsible for verifying that quality is achieved belong to an organizational unit that reports to a management level sufficiently high to provide authority and freedom to identify problems, propose solutions, and verify implementation. A supplement to the first element provides more succinct guidance. The achievement of quality is the responsibility of those who do the work, whereas verification of that achievement is done by those who had nothing to do with the work. Here is a requirement for the separation of the verification of quality from its achievement.

The Nuclear Regulatory Commission, Federal regulators of the nuclear industry, uses a Review Plan to determine whether the requirements of the standard have been complied with. The Review Plan requires the creation of a management position which has sole responsibility the care and feeding of



the QA program. The Review Plan is quite specific: " [This position] is free of non-QA duties and can thus give full attention to assuring that the QA program at the plant site is being effectively implemented."<sup>6</sup> For the nuclear power industry, QA is separate, independent, and placed high in the organization.

NASA uses NHB 5300.4 (1B), Quality Program Provisions for Aeronautical and Space System Contractors. This standard requires that organizations "...make functional assignments to implement each element of [a] quality program."<sup>7</sup> Furthermore, just like the nuclear standard, it dictates that one individual is designated and assigned the responsibility for directing and managing the quality program. Not only shall this individual have "...unimpeded access..." to higher levels of management, but "...shall report regularly to higher management on the status and adequacy of the program."<sup>8</sup> NASA too requires a separate and independent quality assurance program.

The three standards discussed thus far can all be classified as multi-level standards, i.e., standards that would be imposed by customers. The ASQC's Standard C1, Specification of General Requirements for a Quality Standard, is a generic standard. Like the previous three, however, it too requires a separate and independent quality assurance organizational entity. Section 3.1.2 requires that "...[a]dministration of the quality program shall be vested in a responsible, authoritative element of the organization, with clear access to top management." The very next sentence refers to "...the element of the organization..." as if it were a separate entity: "[t]his organization shall be staffed ..." This standard, like the others already discussed, also requires that the quality assurance organization be separate and independent of other organizational entities.

Turning to the second type of literature, books written by recognized experts in quality assurance have a different purpose than do standards. Books do not prescribe, they usually give advice. They abstract from an author's experience lessons which he or she thinks may be worthwhile to others. Books are therefore more concerned with attributes of quality assurance tasks such as their origin, their growth, their evolving roles in an organization, than they are with structure. As in architecture, form follows function, but here the form is usually assumed to be a traditional one.

A good example is Phil Crosby's Quality is Free. Crosby is concerned with describing what the quality tasks are and therefore what the role of the quality organization is, or ought to be. He is less concerned with where the quality organization is organizationally located, or what form it takes, but he does assume it to be an independent entity. Chapter 5 of Quality is Free pertains to quality as an organizational function. The function is separate and distinct from the other organizational functions. Wherever it is located organizationally it should "... always report at the same level as those departments they are charged with evaluating."<sup>9</sup> Whoever is in charge of the quality function "... must have access, on an ordinary basis, to the thought leaders of the company."<sup>10</sup>

Juran and Gryna's widely read Quality Planning and Analysis discusses organizational structure in Chapter 24. Their treatment is largely historical and necessarily simplistic because of its breadth. The chapter begins with the observation that "... [quality related tasks] are not solely performed by the quality control department."<sup>11</sup> Even so the tasks that are performed by the quality control department increased through the years after World War II both in scope and in number and resulted in "... [t]he

emergence of the quality control hierarchy as a major company function..."<sup>12</sup> The authors provide examples of the various organizational configurations that have been, and still are, used to accommodate this organizational entity. Of note here is the notion that quality tasks can be so large and so varied as to warrant their own organizational structure within the overall organization.

One of the most thorough treatments of the organizational quality function from a structural perspective is found in Chapter 8 of Total Quality Control by Armand V. Feigenbaum. It is less historical than Juran and Gryna's chapter and provides more detail. Feigenbaum also finds that the quality function has grown so large and varied that it requires a hierarchy of its own. To the question where in the organization this hierarchy should be located, Feigenbaum replies "...there [is] no categorical [answer] to [this question],..., the trend increasingly has been for the quality control function, just as any other main-line company functions, to report directly to general management...."<sup>13</sup>

This brief literature review easily yields the conclusion that quality related tasks increasingly are viewed as evolving into large and varied organizational functions that warrant their own separate and independent organization and that this organization should be placed high in the overall organizational structure.

#### MAJOR ORGANIZATIONAL STRUCTURES

Students of organizational structure are familiar with the inherent contradictions and incompatibilities of the principles of organization. It is, for instance, desirable to have both a short chain of command and a narrow span of control, but, unfortunately, the two principles are contradictory. Similarly, Herbert Simon argued that the principles of

specialization and unity of command are inherently incompatible.<sup>14</sup> It should, therefore, not come as a surprise that, when researching quality tasks from a structural perspective, similar contradictions pertain. On the one hand there is universal advice to house quality tasks in their own separate and independent organizations, while on the other hand recognizing that, if quality tasks are to have their desired outcome, they must be integrated throughout all the organization's other tasks.

Two questions come to mind. If integration is necessary for success, how does an organization that separates quality tasks from other tasks bring integration about? Crosby has a solution. It lies in the people handling skills of the organization's quality manager. "Every successful quality program I ever saw was headed by an individual who knew how to communicate with, and even discipline, management groups without antagonizing them."<sup>15</sup>

The more interesting second question is, if integration is necessary for success, then why segregate quality tasks to begin with? The answer can be found among the tenets of classical organizational theory.

The classical theory of organizations is based on a set of principles which give an organization structured in observance of those principles its characteristic hierarchical pyramidal shape. Four of these principles are germane to the purpose of this paper.

The first principle stems from the observation alluded to earlier, namely, that when people coalesce to pursue a common goal, division of labor is inevitable. Division of labor is another term for specialization. There are four ways in which an organization can specialize the work that must be done: by purpose, by process, by clientele, or by geography.<sup>16</sup> The specialization of tasks, always a difficult assignment, results in organizational entities such as departments, divisions, branches, offices, and other such groupings.

The second principle is the principle of hierarchical ordering. "The organization of offices follows the principle of hierarchy; that is, each lower office is under the control and supervision of a higher one. In this way no office is left uncontrolled."<sup>17</sup>

Third, closely related to hierarchical ordering is the scalar principle: "...organization[s] must have a supreme authority, and a clear line of authority should run from that person (or group) down through the hierarchy..."<sup>18</sup>

The fourth principle, controversial when it was formulated and controversial still, is unity of command. It was established by Henri Fayol and declares that "... no member of an organization should report to more than one supervisor."<sup>19</sup>

### HIERARCHIES

Hierarchical organizations are referred to as bureaucracies, although not with the pejorative connotation usually associated with that term. In designing a bureaucracy it is not so much a matter of strict adherence to organizational principles, as it is an attempt at finding an optimum balance between them. Underlying the principles is the premise that bureaucracies are governed by rational legal authority and thus tasks and functions are housed in organizational entities, which are described and bounded by rules. This combination usually results in the criticisms one hears concerning hierarchical pyramids.

Into this bureaucracy, with specializations such as manufacturing, marketing, sales and warehousing well defined, another specialization is now introduced: quality. By all accounts this new specialty must be separate and independent, its applicability, however, extends to all other specialties and must be thoroughly integrated with them. Such integration is difficult to do. Hierarchies, rigidly structured and bounded by rules are relatively inflexible. Furthermore

"They also are more afraid of new situations than of familiar ones, since with the new situations, those above them might introduce new evils, while the old ones are sufficient. The hierarchy promotes delays and sluggishness;

.....

Finally, since everything must go through channels, and these are vertical, two people at the same level in two different departments cannot work things out themselves, but must involve long lines of superiors."<sup>20</sup>

Though few organizations match the stark rigidity described above, enough of it exists to cause the implementation of quality assurance programs to be nearly impossible without a means to cross existing organizational boundaries.

#### MATRICES

In matrix organizations functional specialists are administratively located in the department that houses their functional specialty, i.e., engineers in the engineering department, salesmen in the sales department, product developers in the research department. When an organization embarks upon a project, usually a large one, a project team is formed, a project manager is appointed, and members of the team are selected from the functional departments.

A matrix organization can be defined by its primary characteristic, namely, the existence of two chains of command. The functional specialists assigned to work on a project have two superiors, one to whom they report administratively, and one to whom they report on project matters. Another,

albeit implicit, characteristic of the matrix is the assumption that functional specialty departments are a permanent feature of the organization, whereas project teams come and go.<sup>21</sup>

Matrix organizations developed in response to a need for a flexible organization which could be used to manage large and complex problems that were nevertheless of a finite duration. As companies grew larger and more diverse, effective coordination became an increasingly cumbersome task. In addition, hierarchical structures have

"functions and skills ... fragmented throughout the organizational structure. Individual functional departments have great difficulty in solving very large problems because of a failure to view the total system and a tendency to suboptimize or solve the problem within their particular discipline."<sup>22</sup>

The most important advantages of the matrix structure for the management of large projects are efficient coordination, and hence integration, effective information flow and efficient use of resources.<sup>23</sup> From an overall organizational view it suffers from disadvantages some of which are serious enough to discount the matrix's viability as an alternative to the hierarchy.<sup>24</sup> There is, of course, a clear violation of the scalar and unity of command principles with the resulting potential for conflict among competing managers. Beyond this, however, is the obvious fact that the matrix is tremendously complex to manage. It really does not replace the hierarchy, but merely extends it. It superimposes one hierarchy, the project's, onto another, the functional department's.<sup>25</sup>

How does one make quality happen in a matrix organization? The literature reviewed suggests that there should be a functional department that houses all the organization's quality expertise. The project team then

selects a functional specialist from the Quality Department in the same way it selects functional specialists from any other department. Once selected the quality specialist would face the same problems as were described previously for the hierarchy, because the project itself is a hierarchy.

However, matrix organizations have another component, namely, the functional departments. How does quality happen here? Again, the same problems pertain as were described for the hierarchy, for each functional department is usually a hierarchy. The matrix does not ease the problems of implementing quality assurance programs, it, in fact, doubles the effort that would be required.

### PARELLEL STRUCTURES

Despite the many criticisms of the classical principles of organization and the resulting bureaucracies, nothing has yet been found to replace them. Though it is generally agreed that bureaucracies lack flexibility and responsiveness, it is also well understood that few structures can equal bureaucracy's efficiency and effectiveness in routinizing useful procedures and then maintaining those routines.<sup>26</sup>

In recent years a new concept has stirred great excitement among students of organizational structure. The concept is known as parallel organization and is, perhaps, the shape of future organizational structures. Parallel organizations originated in the Quality of Work Life Improvement studies, and only recently were recognized as having significance for general organizational theory.<sup>27</sup>

The parallel organization is an attempt at creating a structure that can be flexible and responsive, yet at the same time retain the efficient maintenance orientation. Its name derives from the fact that alongside the traditional hierarchical structure there exists another, formal structure



with its own independent management, but staffed by people selected from the hierarchy. Like the matrix it has a multiple chain of command, but unlike the matrix it does not extend the hierarchy, but exists parallel to it. The key to understanding parallel organizations is to grasp that it contains two structures which exist side by side, i.e., in parallel. One is the traditional, hierarchical structure. It exists to execute known tasks and functions by maintaining existing routines and procedures. The other is a new, flatter structure. It exists to examine changes and to provide means for the adaptation of useful and necessary changes. In a sense it acts as a buffer structure for the entire organization.<sup>28</sup> "The main task of the parallel organization is the continued re-examination of routines; exploration of new options; and development of new tools, procedures and approaches. It seeks to institutionalize change."<sup>29</sup>

The lessons learned with establishing parallel organizations point toward an effective and efficient way in which to implement new concepts in established organizations. Most organizations are bureaucratic in structure, even those, as was shown, that have adopted the matrix. Once an organization has worked with a particular structure and has evolved a culture around it, making changes is extremely difficult, for it has been shown that "...most change in large organizations will be decidedly limited over the span of any human generation..."<sup>30</sup> Parallel organizations leave the traditional hierarchy intact, while at the same time providing a method to investigate and formulate ways to implement changes to which the organization as a whole can respond. The development and implementation of a quality assurance program, therefore, constitutes an effort for which the parallel organization is well suited.

## IMPLEMENTING A QUALITY ASSURANCE PROGRAM<sup>31</sup>

Developing and implementing a quality assurance program, or any other new concept, while at the same time establishing a parallel organization, can be thought of as a six phase project. The following description presents these six phases using the parallel organization model.

### Phase 1

The first phase is a preliminary one in which the project is legitimized. Legitimization consists of appointing a person to lead the effort, at least through its first three phases, and formulating a theoretical framework with which to work. The theoretical framework consists of answers to three questions: what is quality assurance, why is it necessary to implement it, and what is expected from its implementation. These are very general questions and each organization will have to arrive at its own answer.

### Phase 2

It is vitally important that the members of the organization accept the project. Acceptance is best gained through understanding and the second phase, therefore, consists of efforts to create support and understanding for the project throughout the organization. This may be done by conducting interviews, by holding training sessions to explain the theoretical framework, or having informal group discussions to alleviate any anxiety which usually accompanies projects like this.

During this phase it is also advisable to create a formal group of advisors, a Project Advisory Group, made up of senior managers, to provide "...knowledgeable counsel for decisions needed for implementation, authority for plant personnel participation,..., and high-level linkages to prevent the project from floating unconnected to the rest of [the organization]." <sup>32</sup>

### Phase 3

The third phase is the project study phase. The term study here means a thorough examination of the existing hierarchy and its work flows and processes, and an investigation of possible linkages between the hierarchy and the theoretical framework developed in phase 1. The three questions posed in phase 1 are investigated and the resulting answers will include a suggestion as to the optimum way to implement quality assurance into the existing hierarchy. The study requires formal and systematic data gathering, analytic tools to interpret the data, and a formal method to make the conclusions known to the organization's members. Interviews may be conducted, or questionnaires may be sent out. It is advisable to have a different set of questions for each of the management levels and the working level.

### Phase 4

It is during phase 4 that the foundation for the future parallel organization is formed. Eventually a parallel structure is going to be a permanent feature with both its management and resource allocation independent of the existing hierarchy. It is therefore not only important during this formative phase to pay a great deal of attention to the development of the quality assurance program, but also its implementation. The latter will provide insight into the linkages that must be defined between the new structure and the existing hierarchy. It is crucial that projects undertaken by the new structure pass through to and are implemented by the hierarchy.

The new structure has to be managed and, borrowing a concept from similar projects elsewhere, initially it is best to form a Steering Committee. The Project Manager is a member of the Steering Committee, as are

senior members of the organization who are not already members of the Project Advisory Group. Reporting to the Steering Committee are those groups that were formed as a result of the data gathering of the previous phase. Membership in these groups is determined by interest or expertise in the subject to be studied by the group. For instance, there could be a group formed to "...continue to explore the implications of the data and to propose action plans based upon them."<sup>33</sup> Or, there could be an action group formed to determine strategy and tactics to conduct specific training classes in statistical process control. Whatever the previous phase found in terms of needs could be assigned to a Task Group. "These activities [are] independent of, but parallel to, the internal hierarchy of the [organization]." The parallel organization provides "...a way to detour around bureaucratic structures that might not be working, to see and solve their problems; and [it exists as] a mechanism for managing new activities that exist outside people's jobs."<sup>34</sup>

#### Phase 5

In this phase Task Groups are ready to begin implementation of their specific assignments. This means that the result of all the work is going to be taken to the hierarchical component of the organization. Each Task Group should have the freedom to decide how implementation is going to take place, how to organize for implementation, how to involve members of the hierarchy that were not part of the effort, and how to maintain the existing workload. In short, the Task Group plans the best way to transform what it was able to develop away from the hierarchy into something useful for the hierarchy: it defines linkage. The Steering Committee approves all linkages proposed and coordinates the overall implementation efforts of the newly developed quality assurance program.

## Phase 6

This is the final phase of the first attempt to establish a parallel structure while developing a quality assurance program. Once the parallel organization is established, this activity becomes routine and therefore less visible. "[In this stage], integration and diffusion [define] the central activities."<sup>35</sup> Overall organizational linkages between the parallel organization and the hierarchy that were used by all the Task Groups are defined, examined, and evaluated. When the quality assurance program is successfully transferred to the hierarchical structure, all Task Groups related to the effort dissolve. Future assignments will require different Task Groups.

## CONCLUSION

Developing and implementing quality assurance programs is a task which will have a profound impact on an organization. Such a task usually entails a significant change from the existing ways in which work is accomplished and implementation is therefore a difficult and lengthy process.

Parallel organizations offer a viable alternative to previous methods of effecting organizational change. By structuring a permanent and formal buffer organization, independent of, but parallel to the existing one, changes can be examined and adapted prior to implementation.

## FOOTNOTES

1. Ernest Dale, Management: Theory and Practice 2nd ed. (New York: McGraw-Hill Book Company, 1969), p. 218.
2. "Radical Shake-Up Tests H-P," San Francisco Sunday Chronicle-Examiner, 17 February 1985, pp. A1 and A2.
3. J. M. Juran and Frank M. Gryna, Jr., Quality Planning and Analysis 2nd ed. (New York: McGraw-Hill Book Company, 1980), p. 568.

4. Donald W. Marquardt, "Comparison of Multi-Level and Generic Standards,  
in 1982-ASQC Quality Congress Transactions, (Milwaukee, Wis., n.p.,  
1982), p. 245.
5. U. S., Department of Defense, Office of the Assistant Secretary of  
Defense (Installations and Logistics), Quality and Reliability  
Assurance Handbook H-50, Evaluation of a Contractor's Quality  
Program, 23 April 1965, p. 6.
6. U. S., Nuclear Regulatory Commission, Office of Nuclear Reactor  
Regulation, Standard Review Plan, Section 17.1, p. 17.1-6.
7. U. S., National Aeronautics and Space Administration, Reliability and  
Quality Assurance Office, Quality Program Provisions for  
Aeronautical and Space System Contractors, NHB 5300.4 (1B), April  
1969, p. 2-1.
8. Ibid.
9. Philip B. Crosby, Quality is Free (New York: McGraw-Hill Book Company,  
1979), p. 69.
10. Ibid., p. 60.
11. Juran and Gryna, p. 552.
12. Ibid., p. 561.
13. Armand V. Feigenbaum, Total Quality Control 3rd ed. (New York:  
Mc Graw-Hill Book Company, 1983), p. 191.
14. Dale, p. 198.
15. Crosby, p. 70.
16. Amitai Etzioni, Modern Organizations, Prentice-Hall Foundations of  
Modern Sociology Series (Englewood Cliffs, New Jersey:  
Prentice-Hall, Inc., 1964), p. 22.

17. Max Weber, The Theory of Social and Economic Organizations, trans. A. M. Henderson and Talcott Parsons, ed. and intro. Talcott Parsons (New York: Oxford University Press, 1947, and The Free Press, 1964) p. 330.
18. Dale, p. 189.
19. Desmond D. Martin and Richard L. Shell, What Every Engineer Should Know About Human Resources Management, What Every Engineer Should Know Series (New York: Marcel Dekker, Inc., 1980), p. 23.
20. Charles Perrow, Complex Organizations, Introduction to Modern Society Series (Glenview, Ill.: Scott, Foresman and Company, 1972), p. 36.
21. Linn C. Stuckenberg ed., Implementation of Project Management: The Professionals Handbook (Reading, Mass: Addison-Wesley Publishing Co., 1981) quoted in U. S., Department of Energy, Project Management Series, Increment II, Chapter 6, Matrix Management, p. 22.
22. Ibid., p. 23.
23. Ibid., p. 28.
24. Barry A. Stein and Rosabeth Moss Kanter, "Building the Parallel Organization: Creating Mechanisms for Permanent Quality of Work Life," Journal of Applied Behavioral Science 16-3: p. 383.
25. Stuckenburg, p. 30.
26. Stein and Kanter, p. 382.
27. Ibid., p. 338.
28. Ibid., pp. 382-383.
29. Ibid., p. 383.
30. Herbert Kaufman, The Limits of Organizational Change n.p.: University of Alabama Press, paper back edition, 1975), p. 30.

31. This section is adopted from Stein and Kanter, op. cit., pp. 371-365.
32. Ibid., p. 375.
33. Ibid., p. 377.
34. Ibid.
35. Ibid., p. 379.